

CLAIMS

What is claimed is:

1. An apparatus for detecting a lowering of a top surface of a liquid, comprising:
 - 5 a housing having a housing hole;
 - an insertion member attached to the housing;
 - a dowel defining a dowel longitudinal axis, wherein the dowel has a first end and a second end, and wherein the dowel is inserted into the housing hole;
 - at least one float attached to the dowel;
 - 10 a detector switch having an actuator arm, wherein the detector switch is attached to the housing, and wherein the actuator arm is located proximate the first end of the dowel; and
 - an audio transducer attached to the housing.
- 15 2. The apparatus of claim 1,
 - wherein the insertion member has an insertion member hole, wherein the insertion member hole is at least partially aligned with the housing hole; and
 - wherein the dowel is inserted through the insertion member hole and the housing hole.
- 20 3. The apparatus of claim 2, wherein the housing hole and the insertion member hole are substantially round and have substantially a same diameter.
4. The apparatus of claim 2, wherein the housing has a lateral surface, and wherein 25 the insertion member has a first side face, and wherein the lateral surface and the first side face are substantially parallel, and wherein the lateral surface and the first side face are about 1 cm apart.

5. The apparatus of claim 4, wherein the first side face of the insertion member has a depth, and wherein the depth is less than about 3 centimeters.

6. The apparatus of claim 1, wherein the insertion member has a length, and wherein
5 the length of the insertion member is at least about 5.5 centimeters.

7. The apparatus of claim 2, wherein the insertion member has a width, and each float has a width, and wherein the width of the insertion member is at least as large as the width of each float.

10 8. The apparatus of claim 2, wherein the insertion member has a first side face, and wherein the first side face is curved around an axis that is substantially parallel to the longitudinal axis of the dowel.

15 9. The apparatus of claim 8, wherein the insertion member has a second side face, and wherein the second side face is curved around the axis that is substantially parallel to the longitudinal axis of the dowel.

20 10. The apparatus of claim 1, wherein the housing has a lateral surface, and wherein the lateral surface of the housing is curved around a curvature axis that is substantially parallel to the longitudinal axis of the dowel, and wherein the curvature axis is substantially collinear with the longitudinal axis of the dowel.

25 11. The apparatus of claim 2, wherein the housing has a lateral surface and a ledge, and wherein the insertion member has a first side face, and wherein the insertion member is attached to the ledge of the housing, wherein the lateral surface of the housing and the first side face of the insertion member are substantially perpendicular to the ledge of the housing, and wherein the longitudinal axis of the dowel is substantially perpendicular to the ledge of the housing.

12. The apparatus of claim 1, further comprising a retaining pin attached to the dowel inside the housing.

5 13. The apparatus of claim 1, further comprising a battery socket electrically coupled to the detector switch.

14. The apparatus of claim 1, further comprising an on/off switch electrically coupled to the detector switch and the audio transducer.

10 15. The apparatus of claim 14, wherein the detector switch, the audio transducer, and the on/off switch are electrically coupled in series, and wherein the detector switch is electrically closed when the actuator arm of the detector switch is not pushed by the first end of the dowel.

15 16. The apparatus of claim 14, further comprising a test switch attached to the housing, wherein the test switch is electrically coupled in parallel with the detector switch.

20 17. The apparatus of claim 1, further comprising an indicator light electrically coupled in series with the audio transducer.

18. The apparatus of claim 1, further comprising an indicator light electrically coupled in parallel with the audio transducer.

25 19. The apparatus of claim 1, further comprising an electromagnetic transmitter electrically coupled to the detector switch.

20. The apparatus of claim 19, further comprising an electromagnetic receiver for receiving a signal from the electromagnetic transmitter.

21. The apparatus of claim 1, wherein the detector switch has a first electrical connector and a second electrical connector, and wherein the audio transducer has a first electrical connector and a second electrical connector, and wherein the on/off switch has a first electrical connector and a second electrical connector, and where the battery socket has a first electrical connector and a second electrical connector, and wherein the second electrical connector of the detector switch is coupled to the first electrical connector of the audio transducer, and wherein the second electrical connector of the audio transducer is coupled to the first electrical connector of the battery socket, and wherein the second electrical connector of the battery socket is coupled to the first electrical connector of the on/off switch, and wherein the second electrical connector of the on/off switch is coupled to the first electrical connector of the detector switch.

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22. The apparatus of claim 1, wherein the at least one float comprises a first oblong spheroid defining a first spheroid central axis, and a second oblong spheroid defining a second spheroid central axis, wherein the dowel is inserted through the first oblong spheroid and the second oblong spheroid with the longitudinal axis of the dowel substantially collinear with the first spheroid central axis and the second spheroid central axis.

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23. The apparatus of claim 22, wherein the first oblong spheroid comprises a first cap having a hole and a first rim, and a second cap having a hole and a second rim, wherein the first rim is attached to the second rim to form the first oblong spheroid, and wherein the dowel is inserted through the hole in the first cap and the hole in the second cap, and wherein the second oblong spheroid comprises a third cap having a hole and a third rim, and a fourth cap having a hole and a fourth rim, and wherein the third rim is attached to

the fourth rim to form the second oblong spheroid, and wherein the dowel is inserted through the hole in the third cap and the hole in the fourth cap.

24. The apparatus of claim 22, wherein the first oblong spheroid is larger than the
5 second oblong spheroid, and wherein the first oblong spheroid and the second oblong spheroid are substantially airtight when the dowel is inserted through the first oblong spheroid and the second oblong spheroid, and wherein the second oblong spheroid is located proximate the second end of the dowel, and wherein the first oblong spheroid is located proximate the second oblong spheroid.

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25. The apparatus of claim 1, wherein the at least one float comprises a plurality of substantially airtight containers attached to the dowel.

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26. The apparatus of claim 1, wherein the dowel has a substantially circular cross section and a length of about 31 centimeters.

27. The apparatus of claim 1, wherein the housing is made at least partially of a transparent material, to permit viewing inside the housing.

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28. The apparatus of claim 1, wherein the audio transducer is attached to an exterior surface of the housing.

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29. The apparatus of claim 1, wherein the housing has a bottom surface on the exterior of the housing, and wherein the audio transducer is attached to the bottom surface, and wherein the housing has a first enclosure wall adjacent the bottom surface, a second enclosure wall adjacent the bottom surface, a third enclosure wall adjacent the bottom surface, and a fourth enclosure wall adjacent the bottom surface, for protecting the audio transducer.

30. An apparatus for detecting a decrease of the quantity of a liquid, comprising:
a housing having a housing hole;
an insertion member attached to the housing;
a dowel defining a dowel longitudinal axis, wherein the dowel has a first end and
5 a second end, and wherein the dowel is inserted into the housing hole;
a float attached to the dowel;
a detector switch having an actuator arm, wherein the detector switch is attached
to the housing, and wherein the actuator arm is located proximate the first end of the
dowel; and
10 an indicator light attached to the housing.

31. An apparatus for detecting a decrease of the quantity of a liquid, comprising:
a housing having a housing hole;
an insertion member attached to the housing;
15 a dowel defining a dowel longitudinal axis, wherein the dowel has a first end and
a second end, and wherein the dowel is inserted into the housing hole;
a float attached to the dowel;
a detector switch having an actuator arm, wherein the detector switch is attached
to the housing, and wherein the actuator arm is located proximate the first end of the
20 dowel; and
an electromagnetic transmitter attached to the housing.

32. An apparatus for detecting a lowering of a top surface of a liquid, comprising:
a housing having a housing hole;
25 an insertion member attached to the housing;
an audio transducer attached to the housing;
an electronic moisture detector;

a first wire inserted through the housing hole, wherein the first wire has a first end coupled to the electronic moisture detector, and a second end electrically coupled to the audio transducer; and

5 a second wire inserted through the housing hole, wherein the second wire has a first end coupled to the electronic moisture detector, and a second end electrically coupled to the audio transducer.

33. The apparatus of claim 32, wherein:

10 the insertion member has an insertion member hole;

 the insertion member hole is at least partially aligned with the housing hole, and
 the first wire and the second wire are inserted through the insertion member hole.

34. An apparatus for detecting a leak in a plumbing network that is in fluid communication with the bore of a pipe that has a top end and a bottom end and that is oriented substantially vertically, wherein all openings in the plumbing network that are in fluid communication with the bore of the pipe and that are lower than a first prescribed distance from the top end of the pipe are capped, and wherein the pipe is filled with a liquid so that a top surface of the liquid is no lower than a second prescribed distance from the top end of the pipe, the apparatus comprising:

20 means for placing a float in the liquid;
 means for pushing an actuator arm when the float is in the liquid;
 means detecting if the actuator arm is not being pushed; and
 means for activating a leak indicator, responsive to detecting that the actuator arm is not being pushed.

25 35. A method for detecting a leak, comprising the following operations:
 orienting a longitudinal axis of a pipe substantially vertically, wherein the pipe has a top end, a bottom end, and a bore;

capping all openings that are in fluid communication with the bore of the pipe and that are lower than a first prescribed distance from the top end of the pipe;

filling the pipe with a liquid until a top surface of the liquid is no lower than a second prescribed distance from the top end of the pipe;

5 placing a float in the liquid;

detecting if the float moves at least a third prescribed distance towards the bottom end of the pipe; and

responsive to detecting that the float has moved at least the third prescribed distance towards the bottom end of the pipe, activating a leak indicator.

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36. The method of claim 35, further comprising the operation of forming a watertight connection between the pipe and a pipe network, wherein the bore of the pipe network adjacent the pipe is in fluid communication with the bore of the pipe.

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37. The method of claim 36, wherein the pipe network comprises a plurality of pipes that each have a longitudinal axis, and wherein the operations further comprise orienting the longitudinal axis of at least one of the plurality of pipes in the pipe network at an inclination from horizontal of about $\frac{1}{4}$ inch per foot.

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38. The method of claim 35, wherein the float is placed in the liquid through an opening in the top end of the pipe.

39. The method of claim 35, wherein the operation of activating the leak indicator comprises sounding an alarm.

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40. The method of claim 35, wherein the operation of activating the leak indicator comprises turning on a light.

41. The method of claim 35, wherein the first prescribed distance is no further than the distance from the top of the pipe to a top of the float when the float is placed in the liquid.

5 42. The method of claim 35, wherein the operations further comprise:
activating the leak detector after placing the float in the liquid; and
pressing a test button to test the leak detector after placing the float in the liquid.

10 43. The method of claim 35, further comprising the following operations prior to the operation of filling the pipe with a liquid:
digging a trench; and
placing at least a portion of the pipe network in the trench.

15 44. The method of claim 43, further comprising the following operations after the operation of filling the pipe with a liquid:
putting dirt over at least some of the portion of the pipe network that is in the trench;
placing sand and gravel on at least a portion of the dirt; and
pouring concrete on at least a portion of the sand and gravel.